

OVERVIEW

The youngsters dig up “mystery” plants to investigate their root structures. The roots and shoots of several plants are compared.

BACKGROUND



“Look at that plant!” When someone says this, they are usually looking at only part of the plant: the **shoot**. The shoot is the above-ground part of the plant, which consists of stems, branches, leaves, flowers, and fruit. But there is more to a plant than meets the eye.

Hidden under the soil is the **root** structure. Roots can be extensive, accounting for more than half of the total

mass of the plant. Roots have several vital functions to perform:

1. Anchoring the plant in the soil so that it doesn't wash or blow away.
2. Taking up water and minerals and transporting them to other parts of the plant.
3. Storing food and moisture to keep the plant alive through harsh times such as winters or droughts.

Plants don't all have the same kind of root system. Plants in the grass family, which includes rye grass, crab grass, wild

oats, rice, barley, and corn, have a large mass of small, string-like roots. This is called a ***fibrous root system***. The root system comes out of the ground looking like a mop. No one root is more prominent than the others.

Most other plants rooted in the earth have one or more main roots. Smaller roots branch out from the large roots. This is called a ***taproot system***. Carrots, radishes, and beets are taproots familiar to almost everyone, but dandelions, willow trees, and rose bushes also have taproot systems. Taproots come out of the ground looking like carrots or branches with smaller roots branching off.

CHALLENGE: FIND PLANTS WITH ROOTS LIKE THOSE OF THE TWO MYSTERY PLANTS.

MATERIALS



For each team of two:

- 1 trowel*
- 1 large paper bag*
- 1 Action Card

For the group:

- 2 large brown paper bags*
- tape or string* (to close the bags)
- 1 bucket* of water
- 1 marking pen*
- 1 sheet of Action Cards*

Optional:

hand lenses*

* Available from Delta Education.

PREPARATION

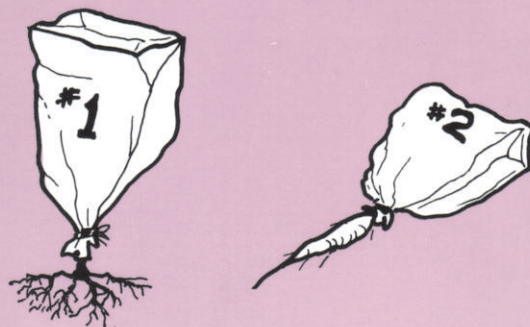


Group Size. This activity is easier to conduct with groups of up to sixteen youngsters. However, it can also be used with larger groups if the site is large enough.

Time. Plan on thirty to fifty minutes for this activity.

Site. The best site for this activity is a weedy lot, lawn, garden, or an old field with soft soil for easy digging. Be sure to obtain permission, if necessary, to dig up the plants in your activity site.

Mystery Plants. Dig up two plants, one with fibrous roots (e.g. a grass plant) and one with a taproot (e.g. dandelion or carrot). Place a brown bag over each plant shoot so that only the root is exposed. Secure the bag tightly with tape or string. Label the fibrous-root plant "Mystery Plant #1." Label the taproot plant "Mystery Plant #2."



ACTION



1. Explain to the youngsters that they will investigate the plants in their activity site, particularly that part of the plant they rarely see: the *roots*. Tell the youngsters that the above-ground part of the plant is the *shoot*, which consists of the stem, branches, leaves, and flowers.
2. Show the group Mystery Plant #1. Explain that the shoot is inside the bag; only the roots are exposed. Ask the group for a descriptive name to use when referring to this plant's roots.
3. Define limits for the activity area. Point out any plants that should not be disturbed.
4. Divide the group into teams of two. Give each team a trowel. Challenge each team to find several different plants with root systems like that of Mystery Plant #1. Encourage the teams to bring back all the plants they dig up for comparison.
5. Go from team to team, encouraging the youngsters to take the time to get *all* the roots with the shoots. Show the kids how to wash the roots clean in the bucket of water.



6. When all the youngsters have washed and examined their roots, call them together and have them form a root "lineup," grouping those plants with roots similar to Mystery Plant #1 together.
7. Some of the plants in the lineup will probably have roots that don't match Mystery Plant #1. Introduce Mystery Plant #2. Ask the group for a descriptive name for this root. Challenge the teams to find plants with similar roots, either from the plants already dug up, or from the activity site. Have the teams follow the same procedure of investigation they used with Mystery Plant #1, ending with another root lineup.
8. Ask a few questions such as:
 - Which kinds of roots were hardest to get out of the ground?
 - Which roots hold the most soil after they are out of the ground?
 - Do roots "branch" like shoots?
 - Shoots have leaves, flowers, and bark. Do roots have structures like these?
9. Ask the youngsters to guess the identity of the two Mystery Plants. Ask if they can tell what the shoot looks like when they can see only the root. Let the kids uncover the mystery shoots. Who was correct?
10. Give each team a large paper bag and an Action Card. Have the teams bring back the plants described on their cards.
11. Optional. Ask each team to explain how its plants fit the challenge on the card. Point out some of the more unusual roots found. Provide hand lenses for close observation.

GETTING TO THE ROOT OF THE MATTER

1. How would you explain two plants of the same kind that have roots that are not the same?
2. Did you find any animals near the roots of the plants? What do you think the animals were doing there?
3. How do animals, including man, use plant roots? Have you ever eaten a root?
4. What kind of root would be best for dry soil? Sandy soil? Wet soil? Hard soil? No soil?

DIGGING DEEPER

1. Explore the differences in root systems on many plants of the same kind. These differences are **variations**. What advantage is variation to a species?
2. Compare root systems on plants from very dry areas with root systems on plants from very moist areas.
3. Germinate some different kinds of seeds on moist paper towels. What structure appears first? Why might that be?
4. Buy some roots from the produce section of the grocery store and plant them. Are they still alive? Will they grow?



**Roots and Shoots
Action Card #1**



FIND:

a plant with a new type of root system, one that has not been found.



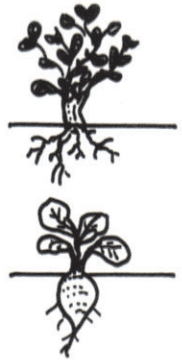
**Roots and Shoots
Action Card #2**



FIND:

a plant with a main *shoot* thicker than its main root,
and

a plant with a main *root* thicker than its main shoot.



**Roots and Shoots
Action Card #3**



FIND:

a plant with a root system wider than its shoot system,
and
a plant with a shoot system wider than its root system.



**Roots and Shoots
Action Card #4**



FIND:

a plant with roots longer than its shoot,
and
a plant with a shoot longer than its roots.



**Roots and Shoots
Action Card #5**



FIND:

a plant with more root branches than shoot branches,
and
a plant with more shoot branches than root branches.



**Roots and Shoots
Action Card #6**



FIND:

a plant with a shallow root system,
and
a plant with a deep root system.

